Mustansiriyah Uni.
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الجامعة المستنصرية
كلية العلوم
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المـرحـلـة ألرابعة

Lecture Title — عنوان المحاضرة

Measures of Central Tendency — مقاييس النزعة المركزية

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لجنة التعليم الالكتروني

weighted mean

A **weighted mean** is a kind of average. Instead of each data point contributing equally to the final mean, some data points contribute more "weight" than others. If all the weights are equal, then the weighted mean equals the arithmetic mean (the regular "average" you're used to). Weighted means are very common in statistics, especially when studying populations.
The formula can be written as:

$$\text{Weighted mean} = \frac{\Sigma wi.xi}{\Sigma wi}$$

- Σ = summation (in other words…add them up!).
- w = the weights.
- x = the value.

Example: - The following data represent the scores of a student in seven subjects and the units of these subjects, find the **weighted mean**

The scores (x): 61,63,56,68,72,70,66
The units (w):   2, 3, 2, 3, 2, 3, 2

$$\text{Weighted mean} = \frac{\Sigma wi.xi}{\Sigma wi}$$

$$= \frac{(61 \times 2 + 63 \times 3 + 56 \times 2 + 68 \times 3 + 72 \times 2 + 70 \times 3 + 66 \times 2)}{17}$$

weighted mean =   65.47

weighted mean for grouped data:

$$\text{Weighted mean} = \frac{\Sigma\, wi.\, fi.\, xi}{\Sigma\, wi.\, fi}$$

Example:
find the weighted mean for the following data:

Classes	Frequencies	Wi
0-2	2	5
2-4	3	6
4-6	6	4
6-8	4	5
8-10	1	4
Total	16	

Solution:

Classes	Frequencies	Wi	Xi	Wi* Fi	Wi* Fi*Xi
0-2	2	5	1	10	10
2-4	3	6	3	18	54
4-6	6	4	5	24	120
6-8	4	5	7	20	140
8-10	1	4	9	4	36
Total	16			76	360

$$\text{Weighted mean} = \frac{\Sigma wi.fi.xi}{\Sigma wifi}$$

$$\text{Weighted mean} = \frac{360}{76} = 4.7$$

The relationship between the mean, the median, and the mode

In statistics, for a moderately skewed distribution, there exists a relation between mean, median and mode. This mean median and mode relationship is known as the "empirical relationship" which has been discussed in detail below.

$$Mean - Mode = 3 \ (Mean - Median)$$

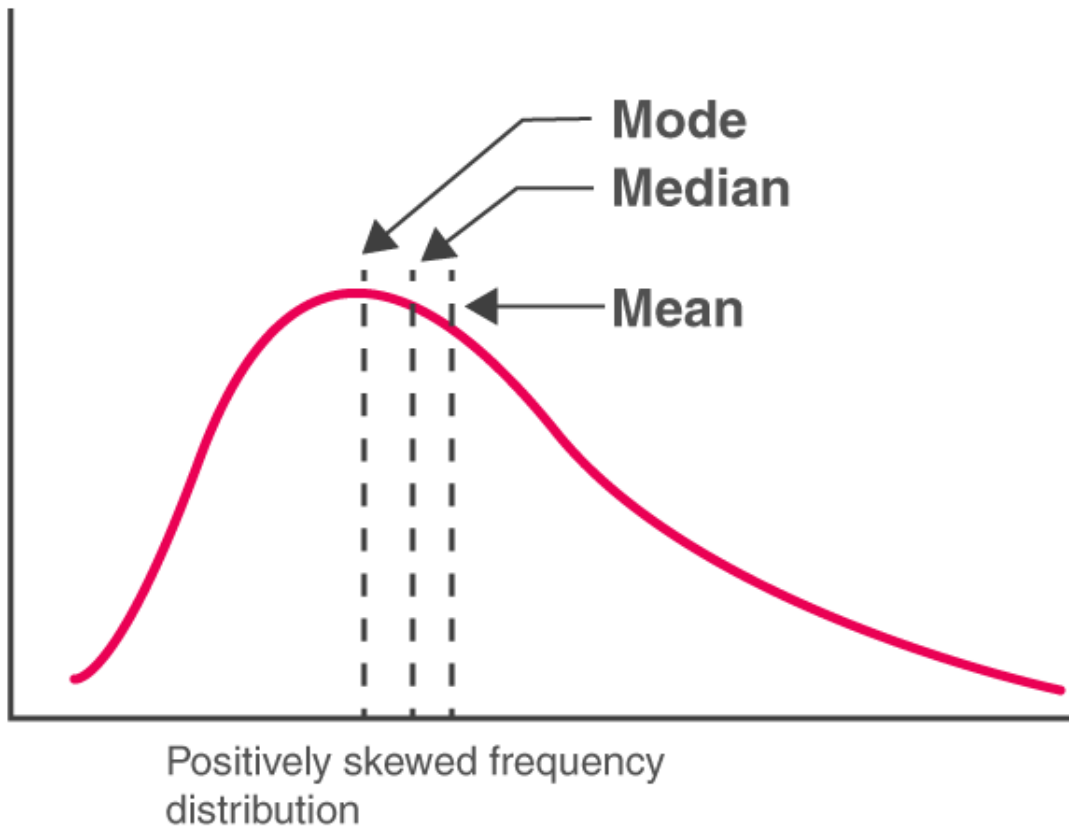## Mean Median Mode Relation with Frequency Distribution

1- If a frequency distribution graph has a symmetrical frequency curve, then mean, median and mode will be equal.
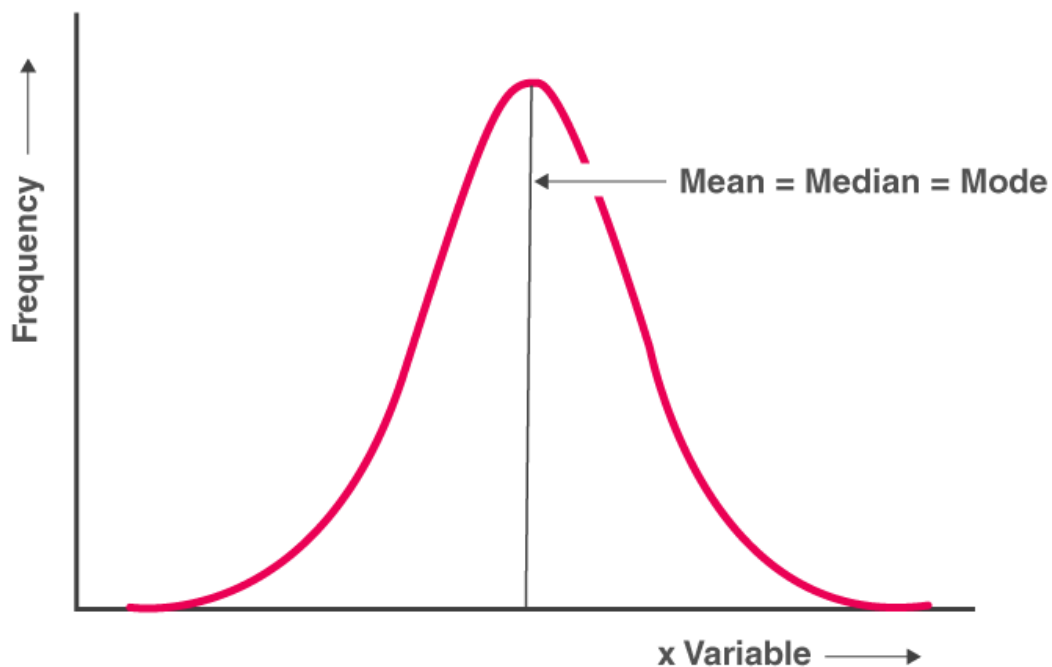
Mean = Median = Mode

2- For Positively Skewed Frequency Distribution

In case of a positively skewed frequency distribution, the mean is always greater than median and the median is always greater than the mode.

Positively skewed frequency distribution

Mean > Median > Mode

3- For Negatively Skewed Frequency Distribution

In case of a negatively skewed frequency distribution, the mean is always lesser than median and the median is always lesser than the mode

Negatively skewed frequency distribution

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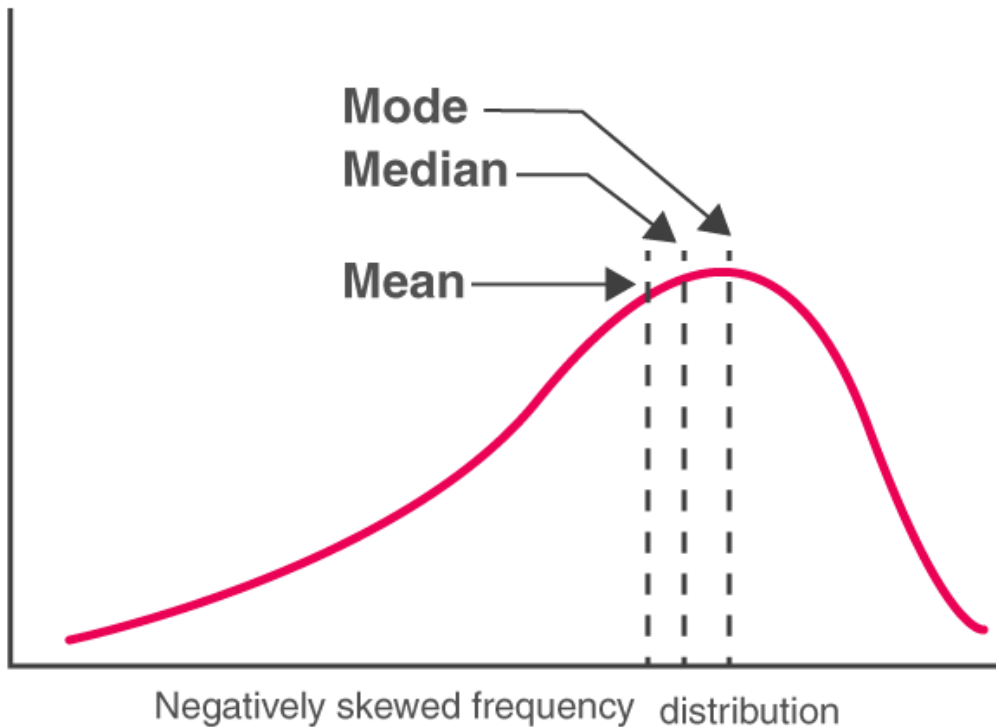
Mean < Median < Mode

Question: In a moderately skewed distribution, the median is 20 and the mean is

22.5. Using these values, find the approximate value of the mode. Determine the

type of skewed distribution.

Solution:

Given,

Mean = 22.5

Median = 20

Mode = x

Now, using the relationship between mean, mode and median we get,

(Mean – Mode) = 3 (Mean – Median)

So,

22.5 – x = 3 (22.5 – 20)

22.5 – x = 7.5

∴ x = 15

So, Mode = 15.

Mean > Median > Mode

22.5 **> 20 >** 15   positive skewed.